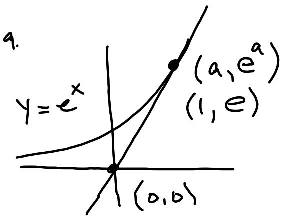
49.



$y' = e^x$

$m = e^a = e$

$\frac{e^a - 0}{a - 0} = m$

$\frac{e^a - 0}{a - 0} = e^a$

$\frac{e^a}{a} = e^a$

$a = 1$

$y = e(x-0)+0$

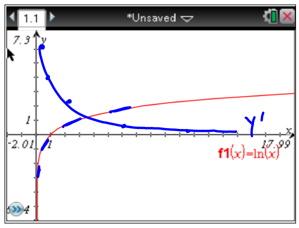
$y = ex$

Oct 2-10:01 AM

3.9b Derivatives of logarithms

Derivative of y=ln(x)

Sketch the graph of the derivative of y=ln(x)



$\left.\begin{array}{l} y = \ln x \\ y = \log_e x \end{array}\right\}$ same

$e^y = x$

$\frac{dy}{dx} \cdot e^y = 1$

$\frac{dy}{dx} = \frac{1}{e^y} = \frac{1}{x}$

$\boxed{\frac{d}{dx} \ln x = \frac{1}{x}}$

$\boxed{\frac{d}{dx} \ln u = \frac{du}{dx} \cdot \frac{1}{u}}$

Oct 5-7:49 PM

Find dy/dx if

$y = \ln(2x)$ $\quad y' = 2 \cdot \frac{1}{2x} = \frac{1}{x}$

$y = \ln\frac{3}{x}$ $\quad y' = \left(\frac{x \cdot 0 - 3 \cdot 1}{x^2}\right) \cdot \frac{1}{3/x}$

$y' = \frac{-3}{x^2} \cdot \frac{x}{3} = -\frac{1}{x}$

$y = \ln 3 - \ln x \quad y' = 0 - \frac{1}{x} = -\frac{1}{x}$

Oct 5-7:55 PM

Properties of logarithms

$y = \log_a x$ means $a^y = x$

$\ln\frac{a}{b} = \ln a - \ln b$

$\ln(ab) = \ln a + \ln b$

$\ln a^n = n \ln a$

logical arithmetic

Oct 2-10:31 AM

Derivative of $y = \log_a x$

$y = \log_a x$ means $a^y = x$

$\frac{dy}{dx} \cdot a^y \cdot \ln a = 1$

$\frac{dy}{dx} = \frac{1}{a^y \ln a} = \frac{1}{x \ln a}$

$\boxed{\frac{d}{dx} \log_a x = \frac{1}{x \ln a}}$

$\boxed{\frac{d}{dx} \log_a u = \frac{du}{dx} \cdot \frac{1}{u \ln a}}$

Oct 5-7:57 PM

Find dy/dx if

$y = \log_2(\sin(x))$ $\quad y' = \cos x \cdot \frac{1}{\sin x \cdot \ln 2}$

$y = x^3 \log_5(2x+1)$

$y' = x^3 \cdot \left[2 \cdot \frac{1}{(2x+1)\ln 5}\right] + 3x^2 \log_5(2x+1)$

Oct 5-7:59 PM

Logarithmic Differentiation

Find dy/dx for $y = x^x$

take ln of both sides $\quad \ln y = \ln x^x$

use prop. of ln to simplify $\quad \ln y = x \cdot \ln x$

implicit differentiation $\quad y' \cdot \frac{1}{y} = x \cdot \frac{1}{x} + \ln x \cdot 1$

solve for y' $\quad y' = (1 + \ln x) y$

substitute for y $\quad y' = (1 + \ln x) x^x$

Oct 5-8:03 PM

Find dy/dx

$y = \frac{\sqrt{2x-1}(x+3)^5}{(x-7)^2}$

$\ln y = \ln \frac{\sqrt{2x-1}\,(x+3)^5}{(x-7)^2}$

$= \ln\left(\sqrt{2x-1}\,(x+3)^5\right) - \ln(x-7)^2$

$= \ln\sqrt{2x-1} + \ln(x+3)^5 - \ln(x-7)^2$

$\ln y = \frac{1}{2}\ln(2x-1) + 5\ln(x+3) - 2\ln(x-7)$

$\cancel{y}\,\frac{1}{\cancel{y}} y' = \left(\frac{1}{2} \cdot 2 \cdot \frac{1}{2x-1} + 5 \cdot \frac{1}{x+3} - 2 \cdot \frac{1}{x-7}\right) y$

$y' = \left(\frac{1}{2x-1} + \frac{5}{x+3} - \frac{2}{x-7}\right) \frac{\sqrt{2x-1}\,(x+3)^5}{(x-7)^2}$

Oct 7-8:56 AM